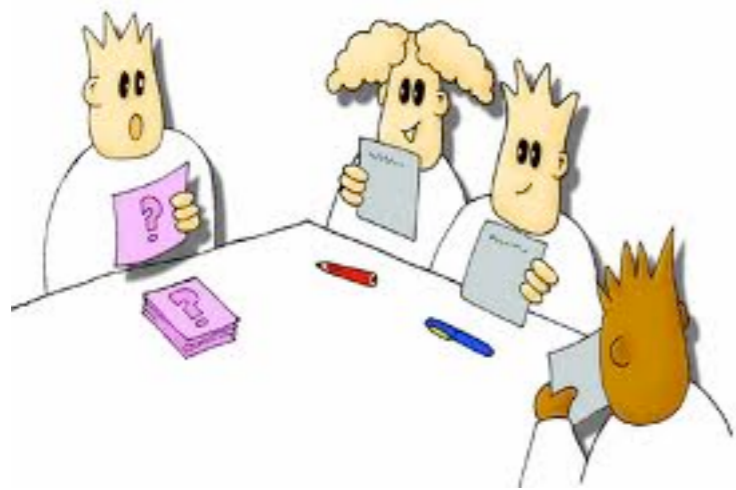


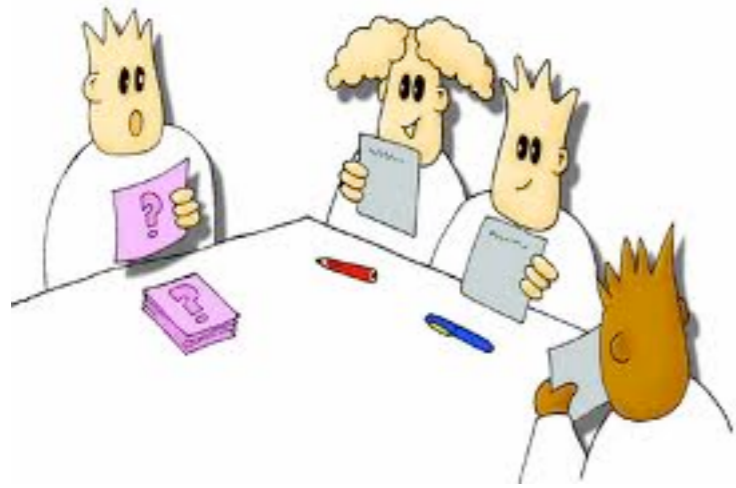
Weekend assignment.

- **Comparing genes in different species**
- Go to **COMPARING GENES** on page 144
- Try the online data sites **(SEE DEMO)**
- Compare search the Gene HBB in Humans **Homo Sapiens, Macaca** monkeys, and Orangutang **Pongo**
- **Compare the first 120 bps -->** calculate the percent similarities between **human vs rhesus monkey** and **human vs orangutang**
- Look at DATA Base 2,3,4 on 145.



From last day, match the term with the correct description.

- a. Gene _____ Two different expressions of the same gene
- b. Allele _____ location of a gene on the chromosome
- c. Chromosome _____ DNA that is loosely coiled
- d. Genome _____ It's a segment of DNA which codes for a protein
- e. Chromatin _____ The entire collection of DNA from a diploid cell of an organism
- f. Locus _____ A body cell, or a cell that is diploid
- g. Somatic _____ DNA that is tightly coiled invisible during cell division



The following is a segment of DNA from the hemoglobin molecule from three different species. Which hypothesis which 2 species are most closely related based on these segments? Provide a reason for your answer.

Species 1

GGACAAGGTGAATGAGGAAGAAGTTGGTGGTGAAGCCCTGGGGCAGGTTAG

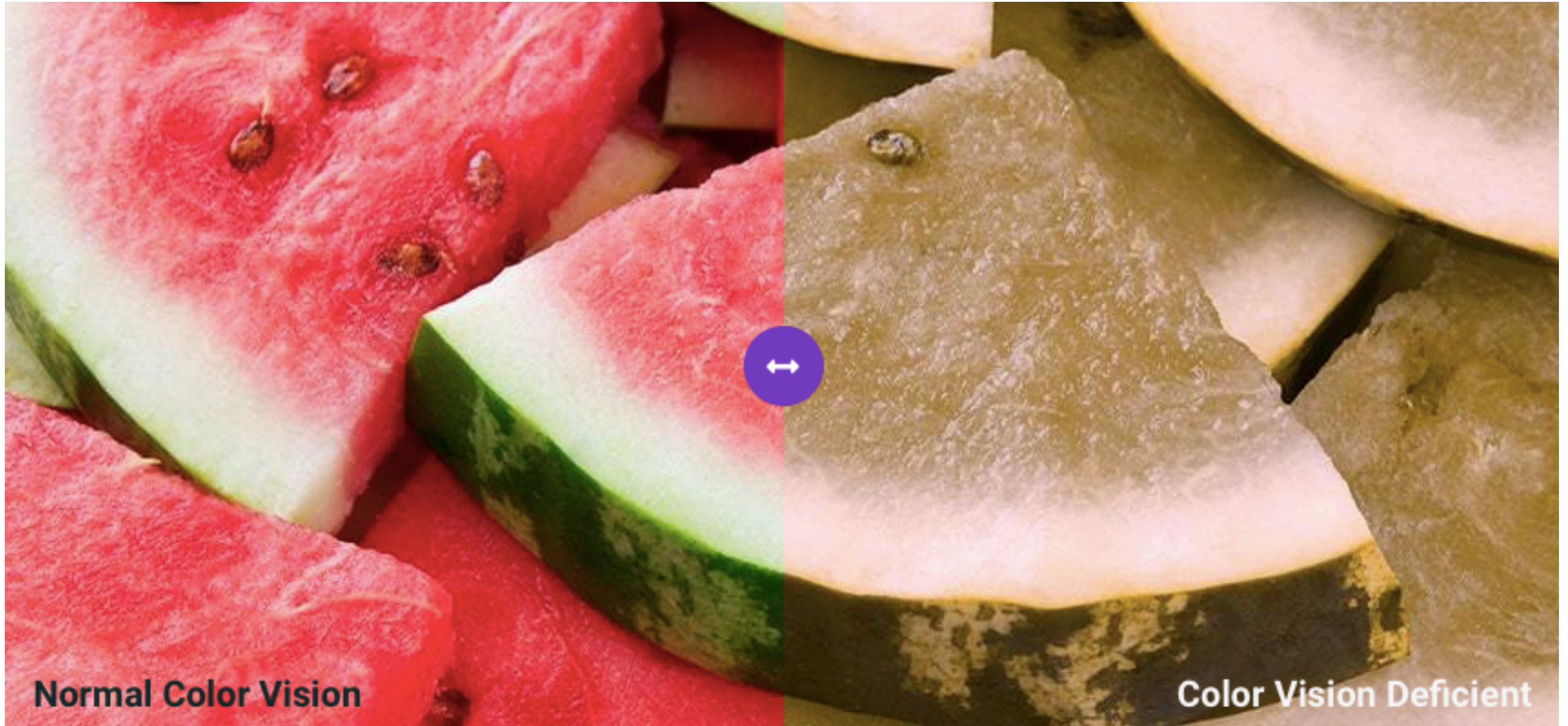
Species 2

GGGCAAAGTGAATGTGGACGAAGTTGGTGGTGAAGCCCTGGGGCAGGTTGG

Species 3

GGGCAAGGTGAAAGTGGATGAAGTTGGTGGTGAAGCCCTGGGGCAGGTTAGG

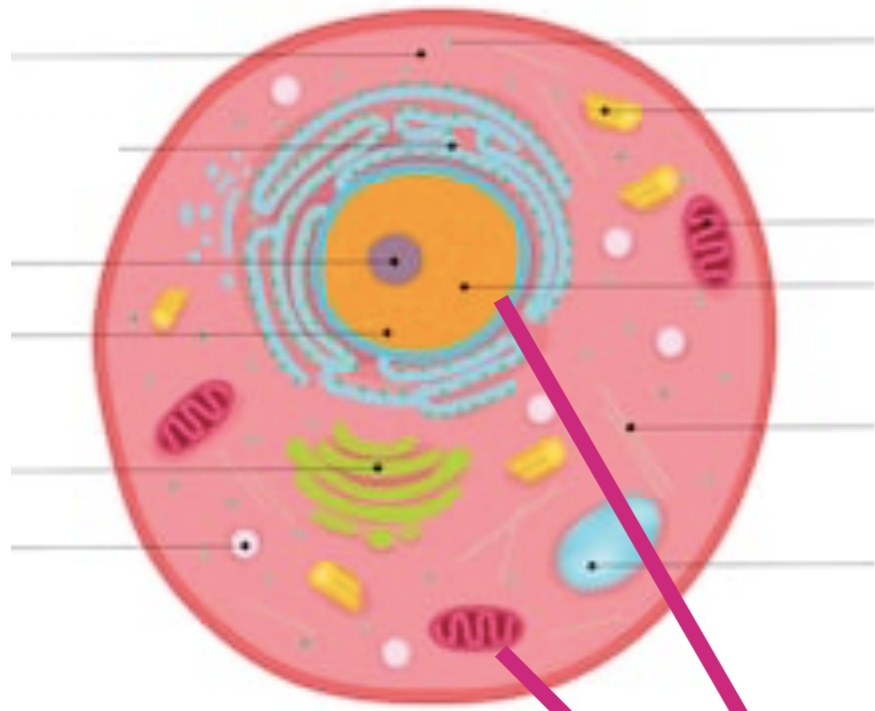
Genes Day 2



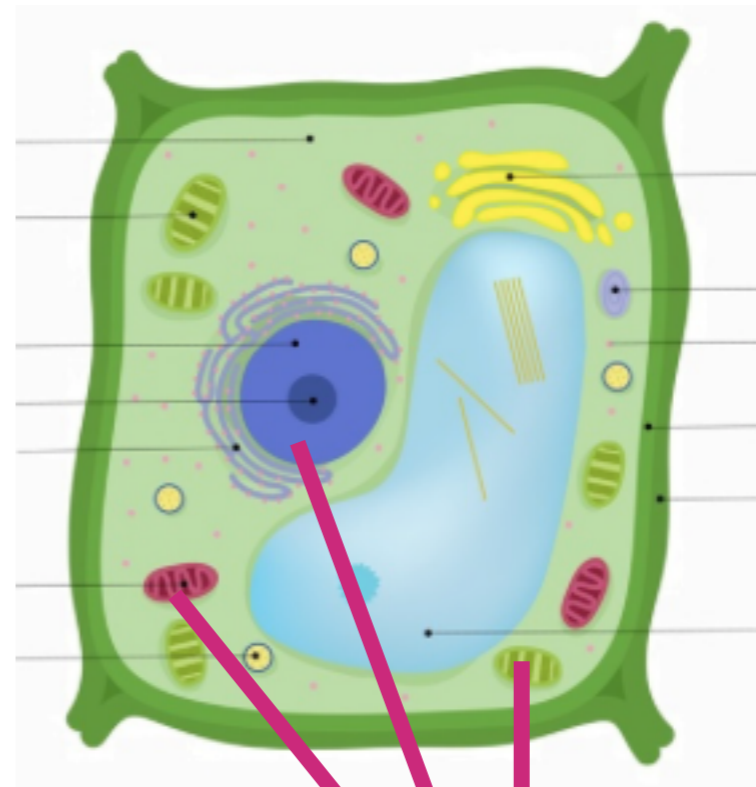
What is a Genome?

The entire base sequence of a DNA molecule of an organism.

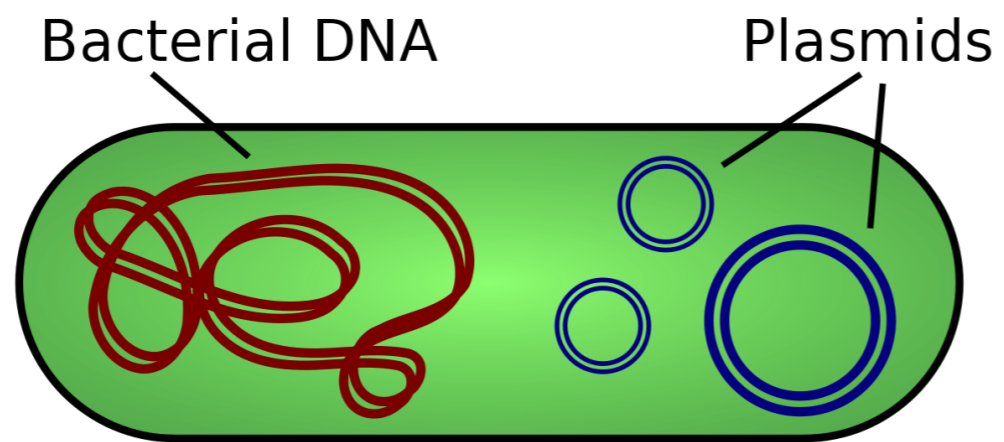
- In human- 46 Chromosomes in the nucleus + the mitochondrial DNA**
- In Plants- The Chromosomes DNA in the nucleus+ mitochondrial DNA + Chloroplast DNA**
- In Prokaryotes - A small circular piece of DNA + plasmids (tiny pieces of DNA loops)**



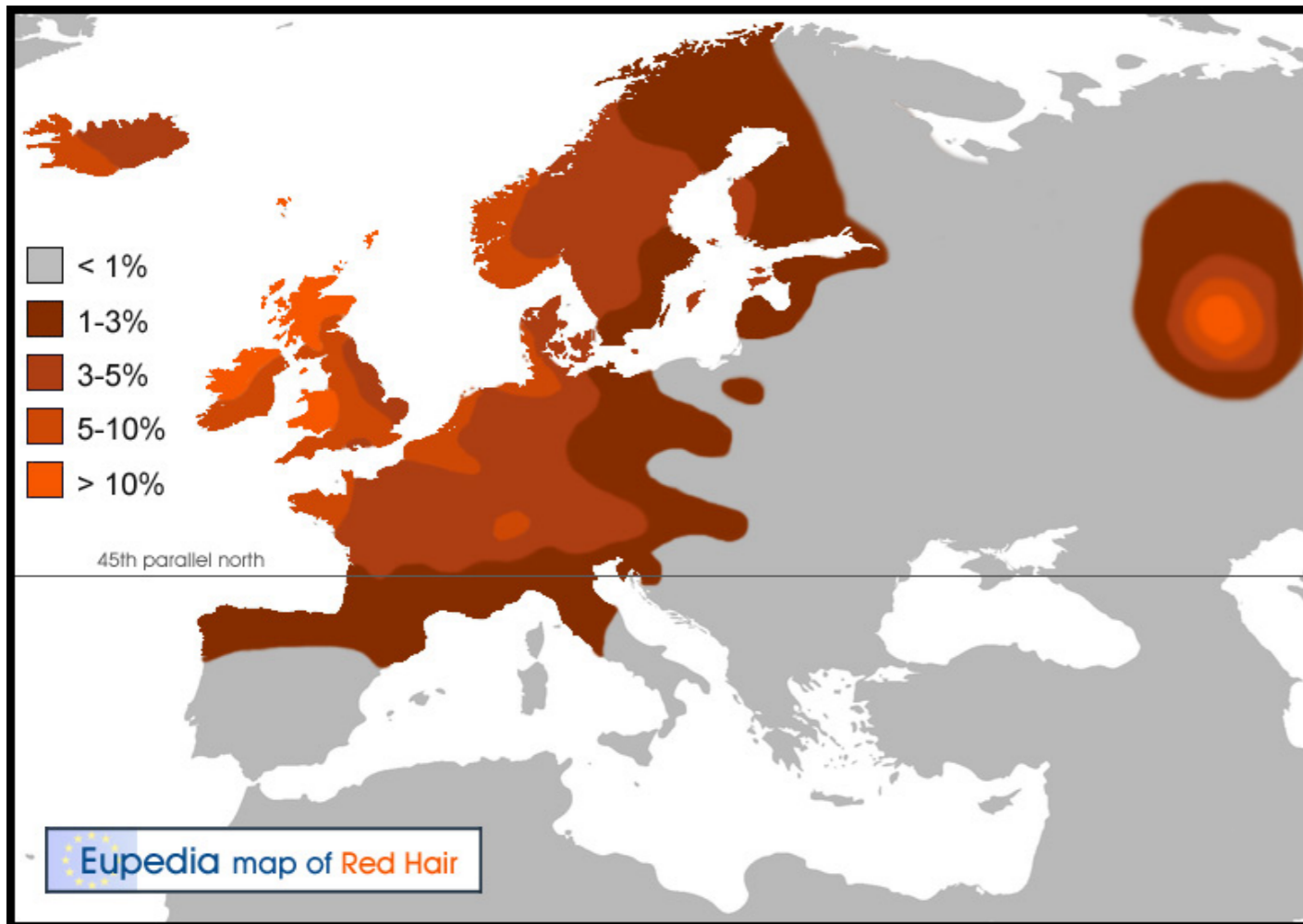
DNA Sources



DNA Sources



Alleles



[Asp294His](#)

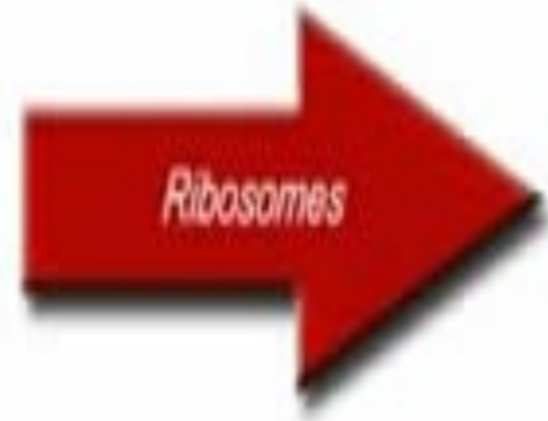
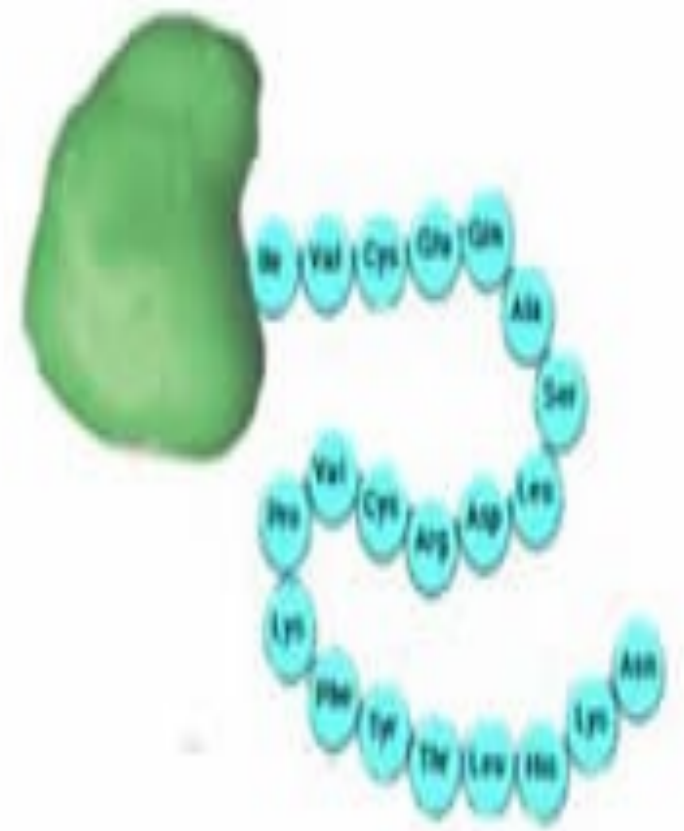
DNA



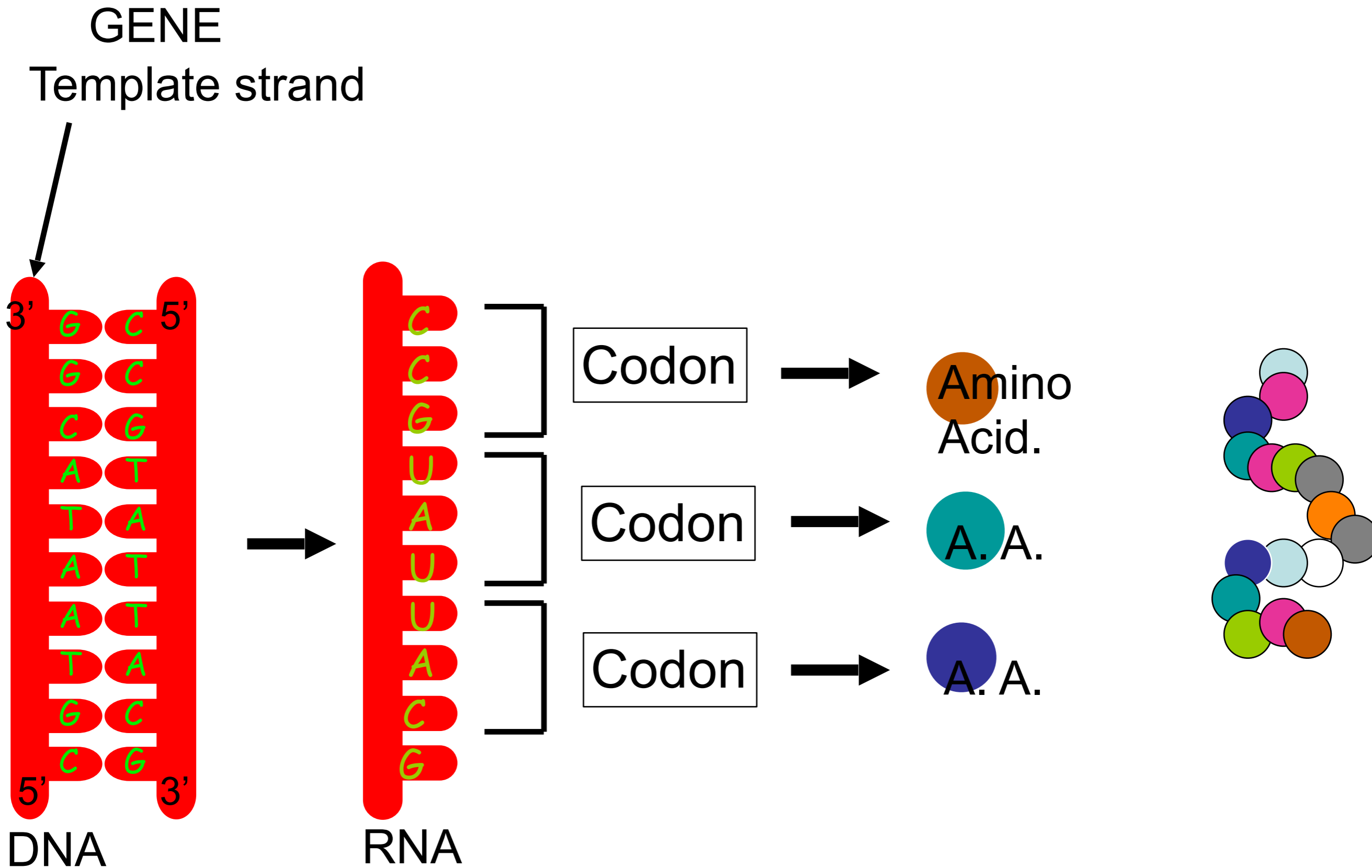
RNA



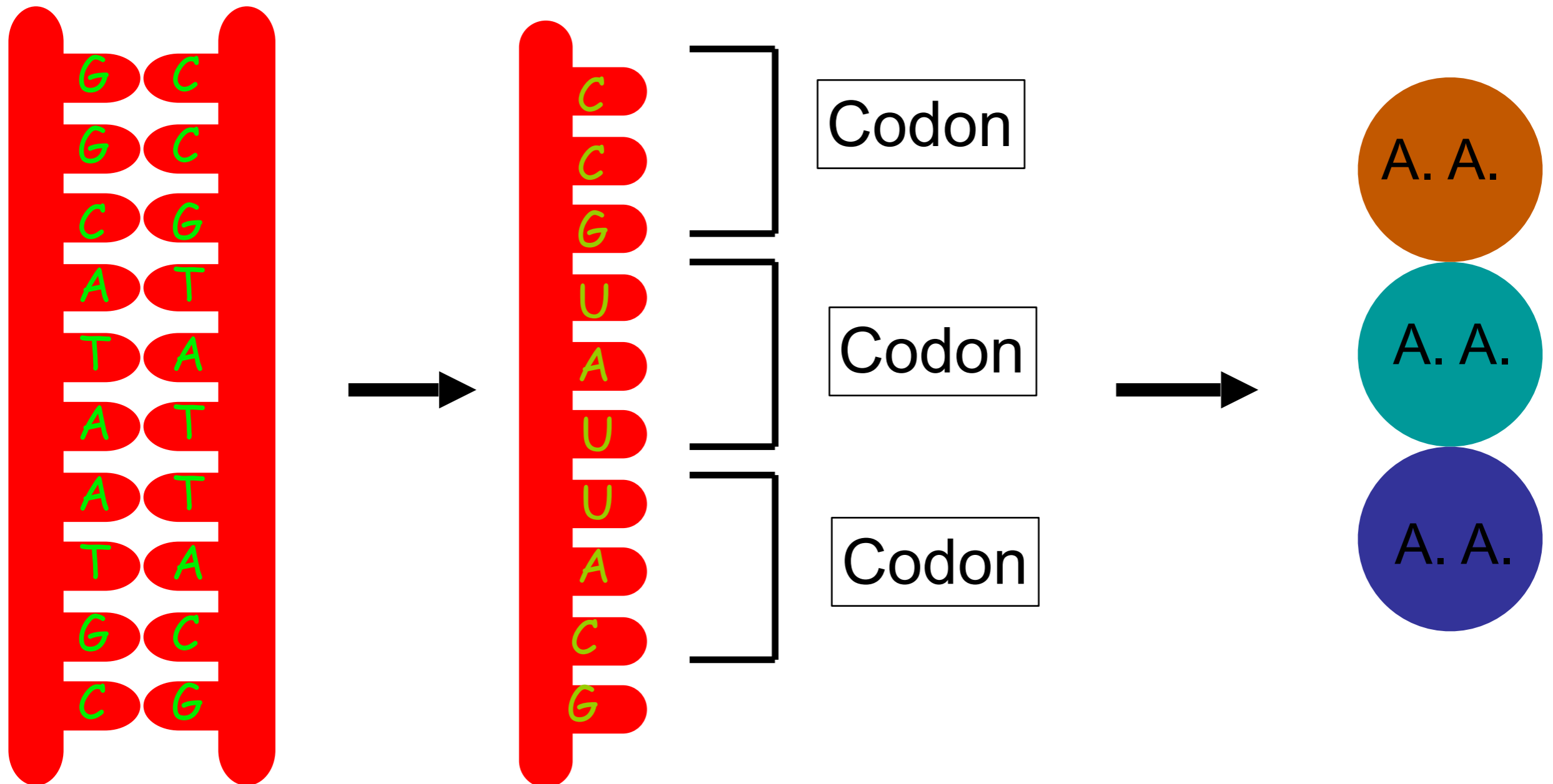
Protein



From Gene to Protein...

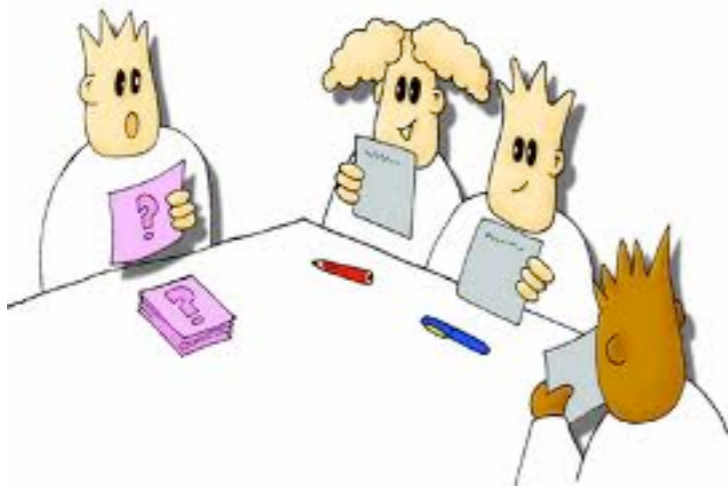


- in humans there approximately 3 billion base pairs found in 23 pairs of chromosomes
- some sequence are called genes and are recipes for cooking up proteins
- In a gene every 3 base pairs are words in the recipe called = codons (codons code for an amino acids)



The Genetic Codon Chart

	U	C	A	G	
U	UUU → Phe UUC → Phe UUA → Leu UUG → Leu	UCU → Ser UCC → Ser UCA → Ser UCG → Ser	UAU → Tyr UAC → Tyr UAA → Stop UAG → Stop	UGU → Cys UGC → Cys UGA → Stop UGG → Trp	U C A G
C	CUU → Leu CUC → Leu CUA → Leu CUG → Leu	CCU → Pro CCC → Pro CCA → Pro CCG → Pro	CAU → His CAC → His CAA → Gln CAG → Gln	CGU → Arg CGC → Arg CGA → Arg CGG → Arg	U C A G
A	AUU → Ile AUC → Ile AUA → Ile AUG → Met	ACU → Thr ACC → Thr ACA → Thr ACG → Thr	AAU → Asn AAC → Asn AAA → Lys AAG → Lys	AGU → Ser AGC → Ser AGA → Arg AGG → Arg	U C A G
G	GUU → Val GUC → Val GUA → Val GUG → Val	GCU → Ala GCC → Ala GCA → Ala GCG → Ala	GAU → Asp GAC → Asp GAA → Glu GAG → Glu	GGU → Gly GGC → Gly GGA → Gly GGG → Gly	U C A G

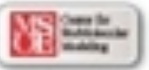


Using the chart figure out the amino acids that are coded for by the following **codons**

CUG UAA CGC UUA GAU

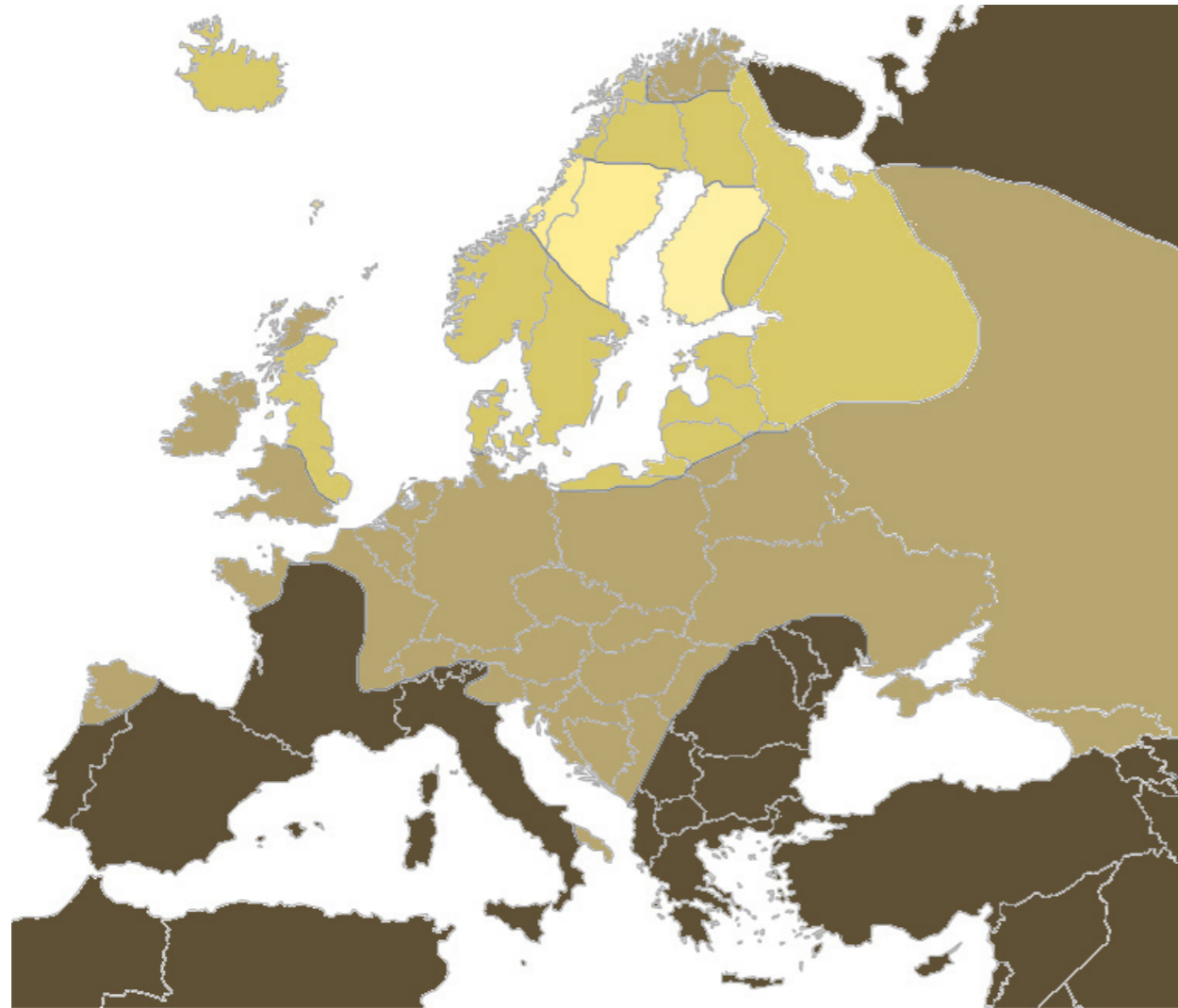
3D Molecular Designs

The Genetic Codon Chart



	U	C	A	G	
U	UUU → Phe UUC → Phe UUA → Leu UUG → Leu	UCU → Ser UCC → Ser UCA → Ser UCG → Ser	UAU → Tyr UAC → Tyr UAA → Stop UAG → Stop	UGU → Cys UGC → Cys UGA → Stop UGG → Trp	U C A G
C	CUU → Leu CUC → Leu CUA → Leu CUG → Leu	CCU → Pro CCC → Pro CCA → Pro CCG → Pro	CAU → His CAC → His CAA → Gln CAG → Gln	CGU → Arg CGC → Arg CGA → Arg CGG → Arg	U C A G
A	AUU → Ile AUC → Ile AUA → Ile AUG → Met	ACU → Thr ACC → Thr ACA → Thr ACG → Thr	AAU → Asn AAC → Asn AAA → Lys AAG → Lys	AGU → Ser AGC → Ser AGA → Arg AGG → Arg	U C A G
G	GUU → Val GUC → Val GUA → Val GUG → Val	GCU → Ala GCC → Ala GCA → Ala GCG → Ala	GAU → Asp GAC → Asp GAA → Glu GAG → Glu	GGU → Gly GGC → Gly GGA → Gly GGG → Gly	U C A G

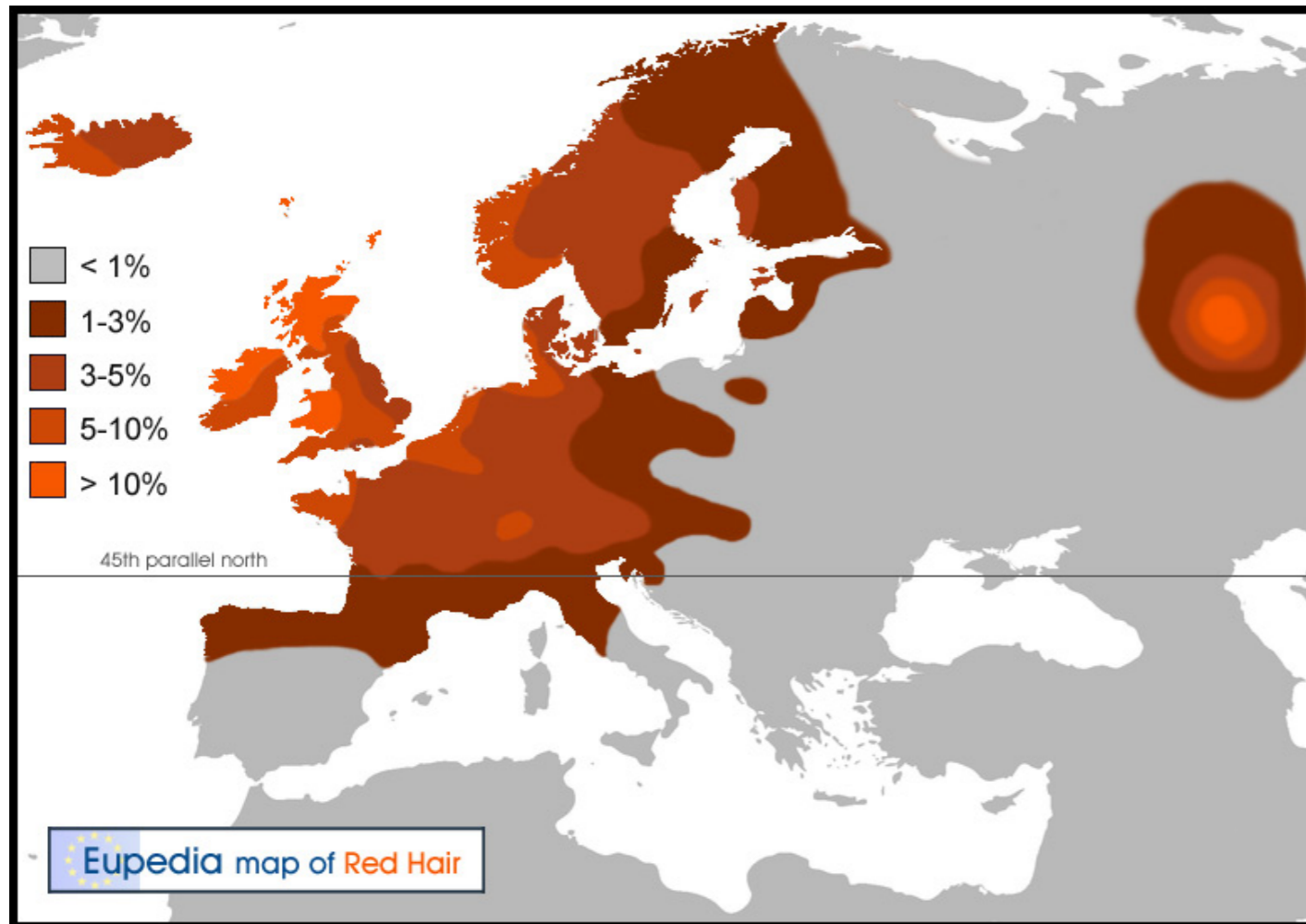
Blond-Alleles



Percentage of light hair in Europe



Red-Alleles



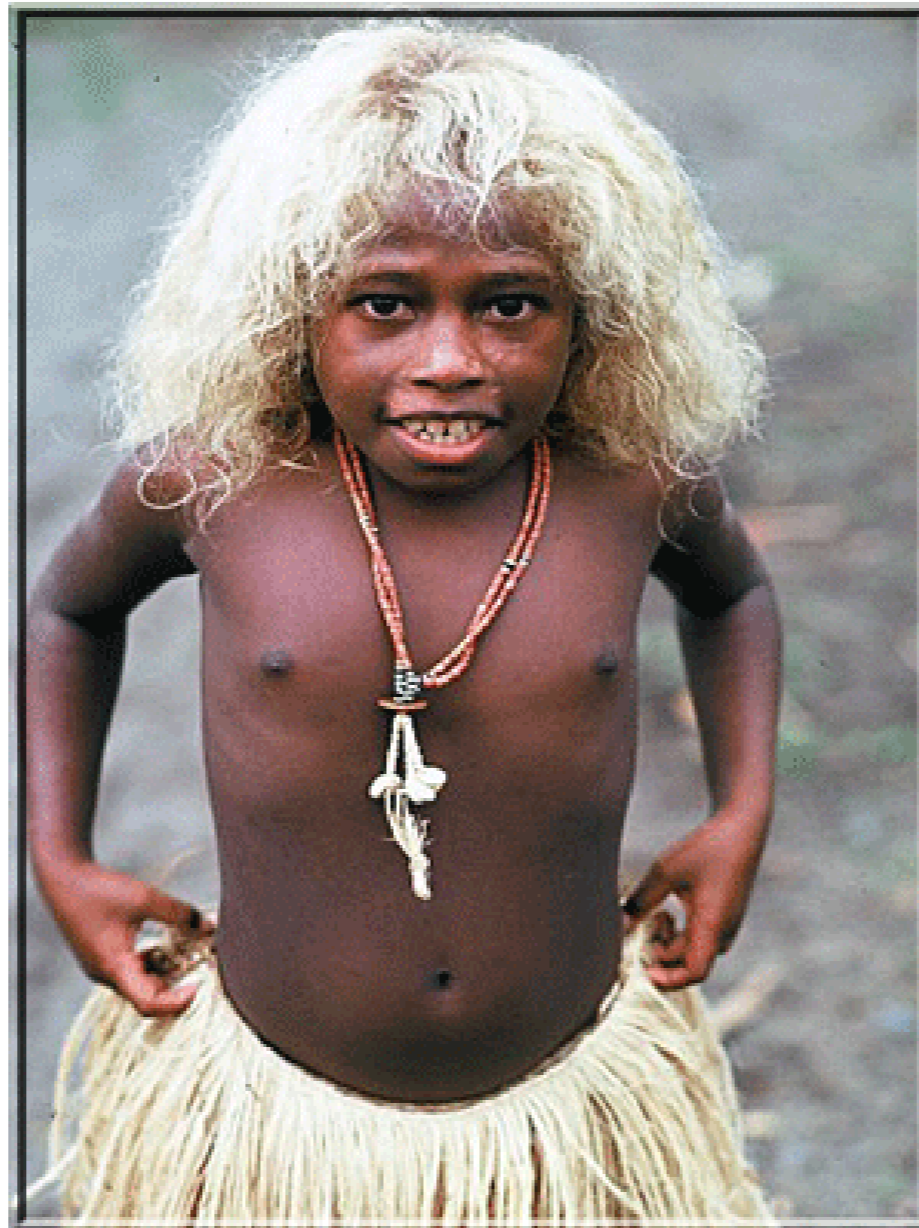
[Asp294His](#)

Mutations- changes in the DNA code

+ changes results in improved success to the individual

neutral(\emptyset) changes results has no effect

- changes results in creating a disadvantage

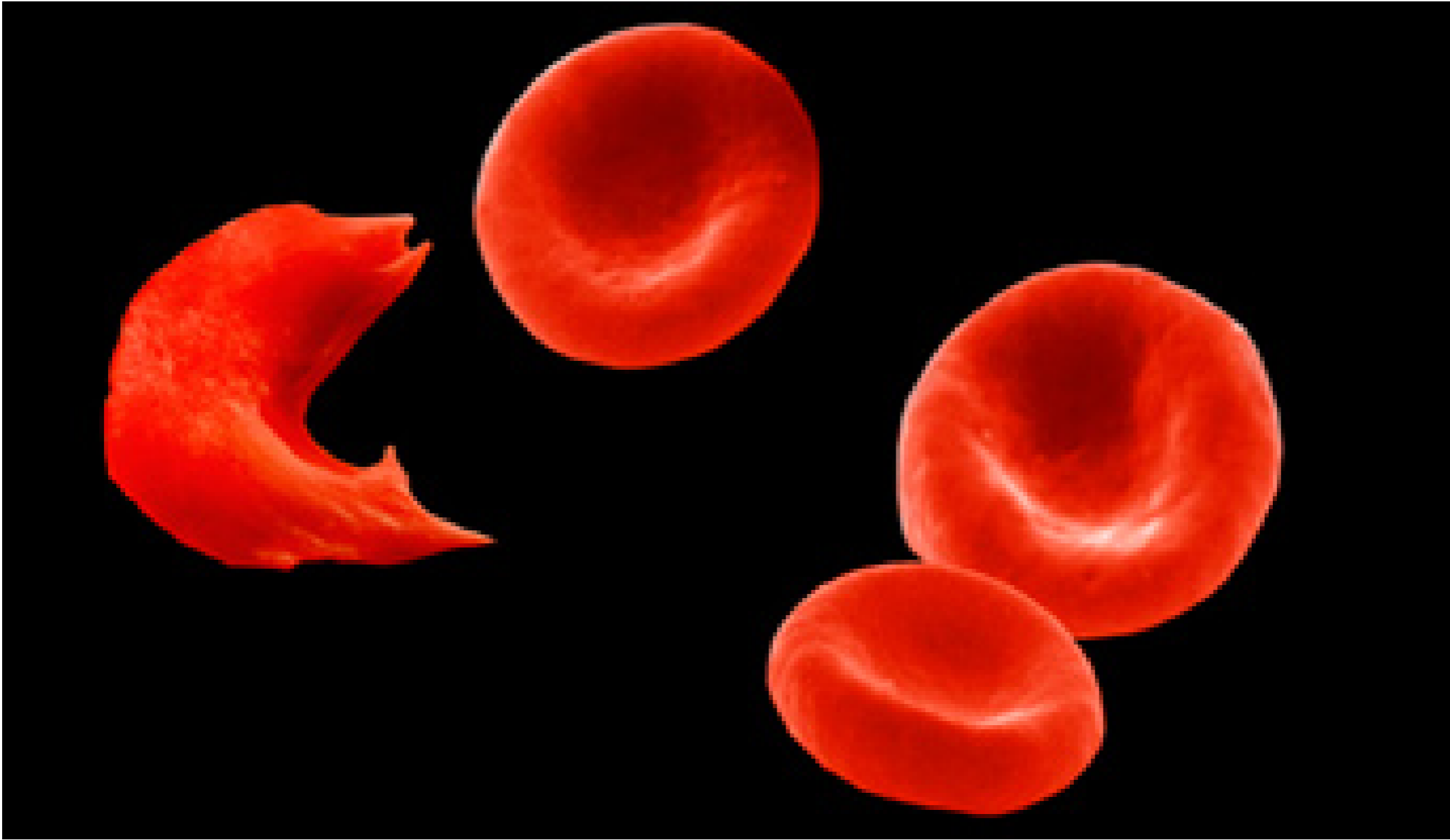


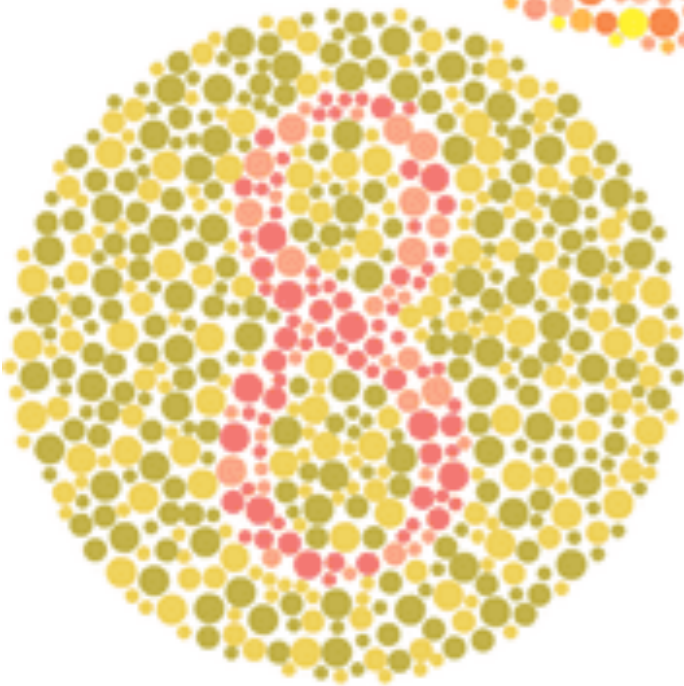
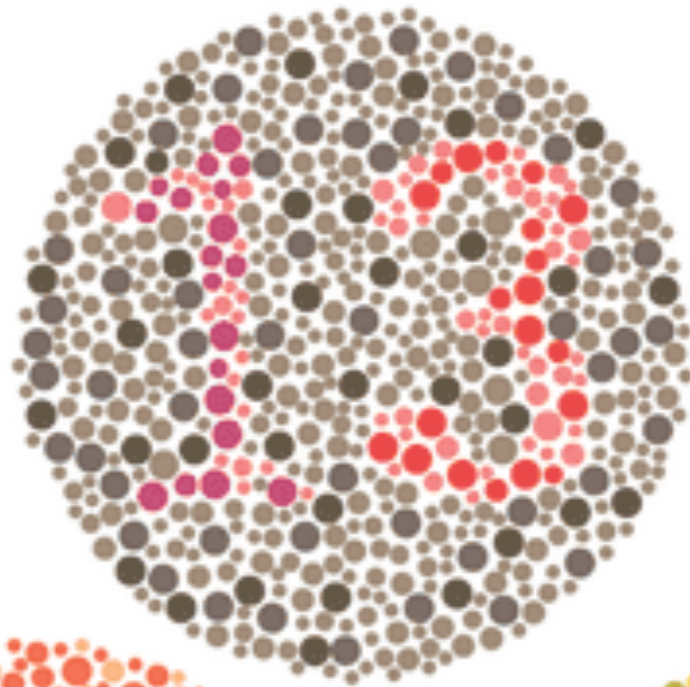
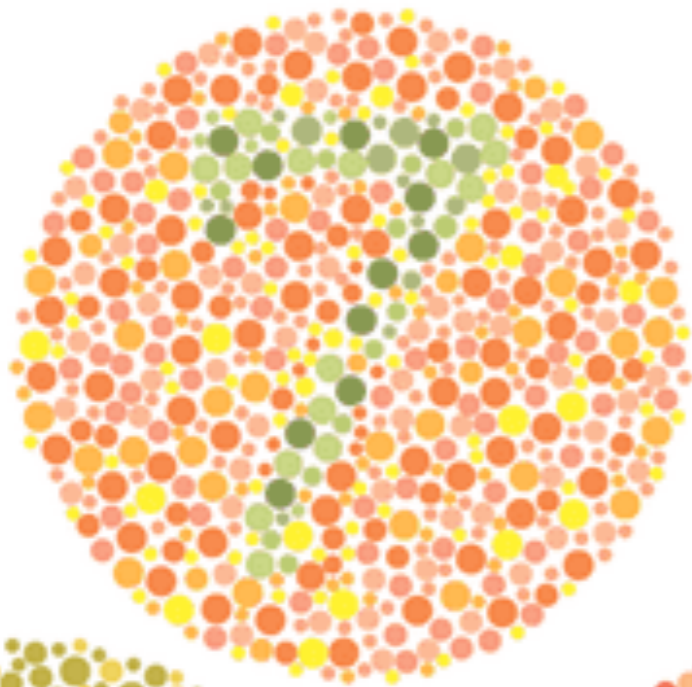






Tripthalangeal Thumb (TPT)





Small-Scale - Mutations

- **point mutations** (single base pair)
 - Substitution of a letter (**mis-sense, non-sense**)
 - **mis-sense (one amino acid)**
 - **non-sense (premature stop making a short protein)**
 - Insertion/deletion of a letter (called **frameshift** mutations)
 - **frameshift (every amino acid is affected down the line)**
 - Silent mutation changes that have no effect on the end protein

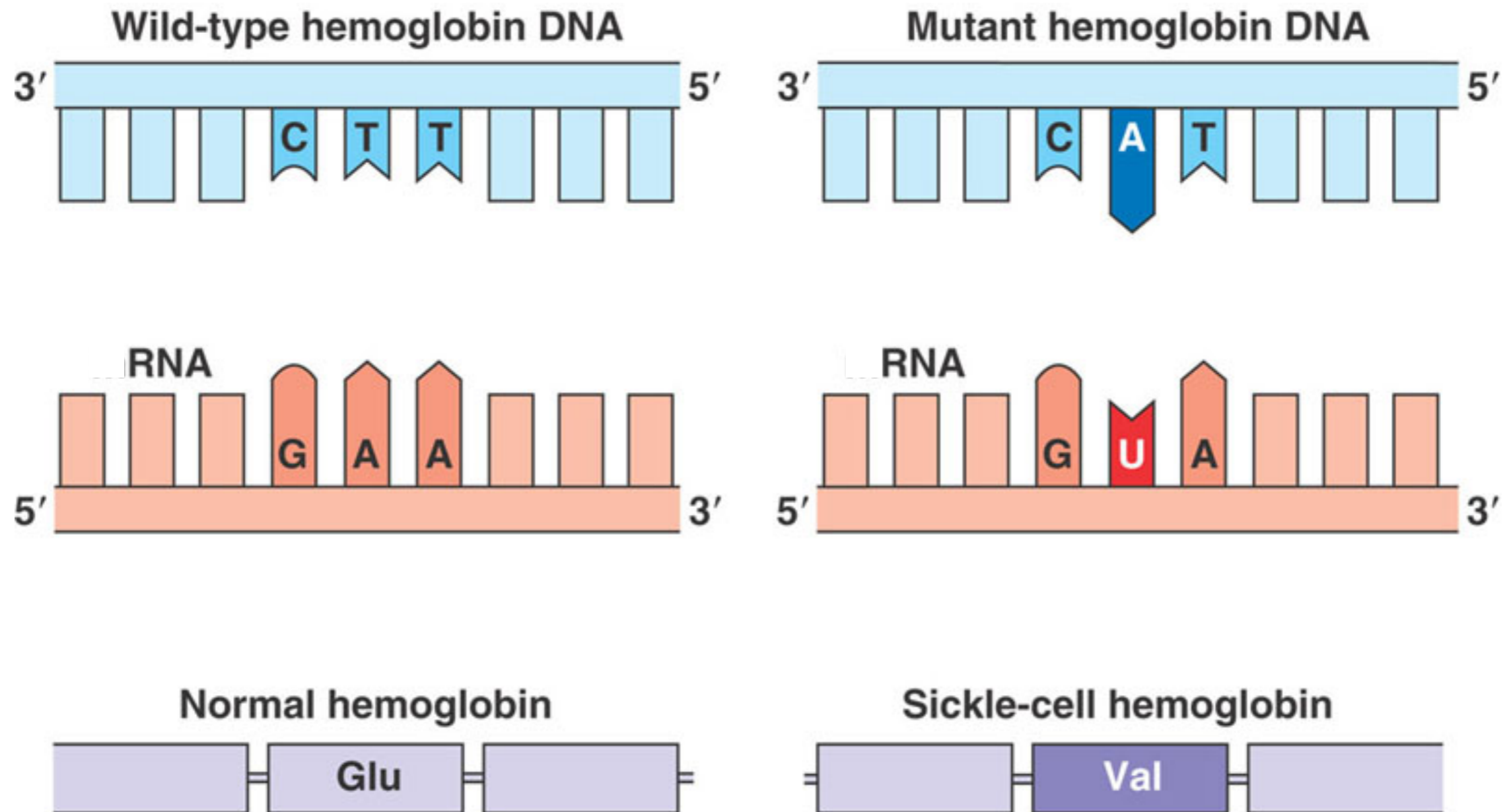
THE FAT CAT SAT

THE FAD CAT SAT

THE ATC ATS AT

THE EFA TCA TSA T

Point mutation (One letter wrong)



End results is a single letter changed in the protein by a single chemical component



What happens to the protein in the following 4 cases?

Correct RNA sequence

CCU CUC GAA UAU GGG

MUTATION #1

CCU CUG GAA UAU GGG

MUTATION #2

CCU GUC GAA UAU GGG

MUTATION #3

CCC UCG AAU AUG GG

MUTATION #4

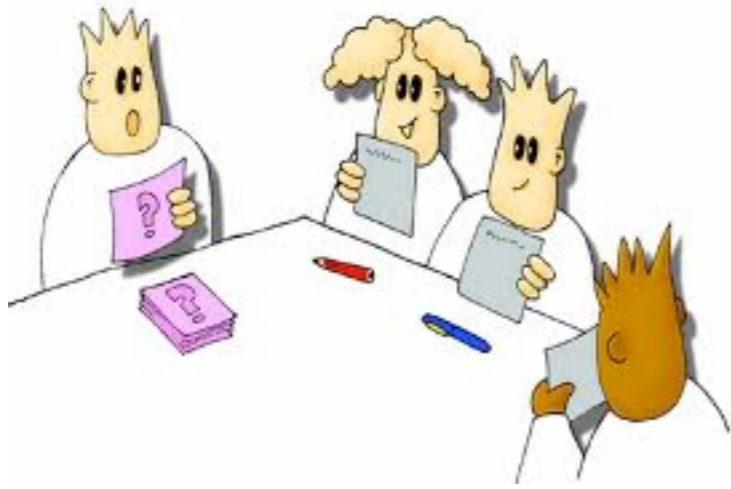
CCU CUC GAA UAA GGG

	U	C	A	G	
U	UUU → Phe UUC → Phe UUA → Leu UUG → Leu	UCU → Ser UCC → Ser UCA → Ser UCG → Ser	UAU → Tyr UAC → Tyr UAA → Stop UAG → Stop	UGU → Cys UGC → Cys UGA → Stop UGG → Trp	U C A G
C	CUU → Leu CUC → Leu CUA → Leu CUG → Leu	CCU → Pro CCC → Pro CCA → Pro CCG → Pro	CAU → His CAC → His CAA → Gln CAG → Gln	CGU → Arg CGC → Arg CGA → Arg CGG → Arg	U C A G
A	AUU → Ile AUC → Ile AUA → Ile AUG → Met	ACU → Thr ACC → Thr ACA → Thr ACG → Thr	AAU → Asn AAC → Asn AAA → Lys AAG → Lys	AGU → Ser AGC → Ser AGA → Arg AGG → Arg	U C A G
G	GUU → Val GUC → Val GUA → Val GUG → Val	GCU → Ala GCC → Ala GCA → Ala GCG → Ala	GAU → Asp GAC → Asp GAA → Glu GAG → Glu	GGU → Gly GGC → Gly GGA → Gly GGG → Gly	U C A G

Human Genome Project

Human Genome Discoveries

- Increase numbers and types of genes (23,000)
- Discovery of **Junk DNA** (sequences that don't make protein) vs **Satellite DNA** (sequences Repetitive sequence that make up the centromere in most cases)



One long piece of DNA that is 50 bases long was sequenced using the Sanger method of sequencing. Four fragments that have overlapping segments were produced below. Try to determine the original length of DNA..

CGGGTAGCTT

GAGCCCTTAGCCGGG

GCTTAGTCTACC

CTACCCTTAGGAA

Assignment

Make a chart of the following point mutations disorders

- Colour Blindness
- Haemophilia
- Cystic fibrosis
- Phenylketonuria
- **Sickle cell**

In the chart, include the following headings; **Gene Affected, Type of Mutation, Symptoms, and Side Effect of the Mutation.**